

Karenwebberite, Na(Fe²⁺,Mn²⁺)PO₄, a new member of the triphylite group from the Malpensata pegmatite, Lecco Province, Italy

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ABSTRACT

Karenwebberite, Na(Fe²⁺,Mn²⁺)PO₄, belongs to the triphylite group of minerals and corresponds to the Fe-equivalent of natrophilite or to the Na-equivalent of triphylite. It occurs in the Malpensata pegmatite dike, Colico, Lecco Province, Italy. Karenwebberite is found as late-magmatic-stage exsolution lamellae up to 100 μm thick, hosted by graptolite and associated with Na-bearing ferrisicklerite and with a heterosite-like phase. Lamellae are pale green, with very pale grayish-green streak. The luster is greasy to vitreous, and lamellae are translucent (pale green) to opaque (dark green). Optically, the mineral is anisotropic, biaxial (+), α = 1.701(2), β = 1.708(2), γ = 1.717(2) (for λ = 589 nm), 2V_{meas} = 87(4)°, 2V_{calc} = 41°, Z = b. Pleochroism is moderate with X = dark gray, Y = brown, and Z = yellow. The mineral is brittle with a Mohs hardness of 4.5; in thin section it displays a perfect cleavage along {001} with an irregular fracture. Karenwebberite is non-fluorescent either under short-wave or long-wave ultraviolet light, and its calculated density is 3.65 g/cm³. The mean chemical composition, determined by the electron microprobe from 16 point analyses (wt%), is: P₂O₅ 41.12, Fe₂O₃* 7.00, FeO* 25.82, MgO 0.23, ZnO 0.11, MnO 9.31, CaO 0.10, Na₂O 14.66, total 98.41 (*: calculated values). The empirical formula, calculated on the basis of 1 P atom per formula unit from, is (Na_{0.817}Ca_{0.003}□_{0.180})_{Σ1.000}(Fe_{0.622}Mn_{0.228}Fe_{0.151}Mg_{0.010}Zn_{0.002})_{Σ1.013}PO₄. Karenwebberite is orthorhombic, space group *Pbnm*, a = 4.882(1), b = 10.387(2), c = 6.091(1) Å, V = 308.9(1) Å³, and Z = 4. The mineral possesses the olivine structure, with the M1 octahedra occupied by Na, and the M2 octahedra occupied by Fe and Mn. The eight strongest lines in the X-ray powder pattern are [d in Å (intensities) (hkl)]: 5.16 (50) (020), 4.44 (90) (110), 3.93 (80) (021), 3.56 (90) (120), 3.04 (80) (002), 2.817 (100) (130), 2.559 (100) (131), and 1.657 (50) (061). The mineral is named in honor of Karen Louise Webber, Assistant Professor Research at the Mineralogy, Petrology and Pegmatology Research Group, Department of Earth and Environmental Sciences, University of New Orleans, Louisiana, U.S.A.

Keywords: Karenwebberite, new mineral, phosphate, Malpensata pegmatite, Lecco Province, Italy, pegmatites